

ESA-080-2, General Motors – Bedford, IN, Plant Final Public Report

Company	General Motors - Powertrain	ESA Dates	June 19 – June 21, 2007
Plant	Bedford Casting Plant, Bedford, IN	ESA Type	Process Heating - PHAST
Product	Cast Aluminum Automotive Parts	ESA Specialist	John Clarke

Introduction:

GM Powertrain designs, engineers and manufactures engines, transmissions, castings and components for General Motors vehicles and other automotive, marine and industrial original equipment manufacturers. It has operating and coordinating responsibility for GM's powertrain manufacturing plants and engineering centers in North America, South America, Europe and the Asia-Pacific region and has its global headquarters in Pontiac, Michigan. With its alliance partners that includes the Fiat-GM Powertrain joint venture, Fuji Heavy Industries, Isuzu and Suzuki, GM has access to almost 25 percent of the global industry's total powertrain capacity.

The GM Powertrain team, which includes approximately 76,000 members, represents the largest workforce of any GM division. GM Powertrain also ranks among the world's largest automotive suppliers.

The ESA occurred at the GMPT's Bedford Casting plant in Bedford, Indiana. The furnaces analyzed are used to melt and hold aluminum to be used in die casting and permanent Mold castings. The assessment was initiated by the UAW/WFG Joint Task Team, the WFG Energy & Utilities Group, and supported locally by Plant Contacts.

Objective of ESA:

The objective of the ESA was three fold:

1. Introduce the PHAST program to plant personnel.
2. Train plant personnel on the use of the PHAST program by applying it to real world applications. During this phase, assess the strengths and weakness of the analysis and develop methods to ensure an accurate outcome.
3. Facilitate a discussion of fuel savings opportunities among the participants.
4. Identify and quantify specific energy savings opportunities. Estimate required resources. Focus on projects that fall within the corporate payback targets.

Focus of Assessment:

ESA examined the thermal performance of a number of batch melting and holding furnaces. Areas analyzed included work flow, natural gas or electricity consumption, heat containment (wall and hole losses) and burner efficiency (when applicable). Furnaces were selected based on their overall energy consumption as well as how effectively their modeling would teach the use of the Process Heating and Assessment Scoping Tool. (PHAST)

Approach for ESA:

Working with plant personnel, the agenda was altered to obtain the most valuable outcome. In brief, the process went as follows:

Discussed the overall process and provide plant personnel time to determine the best target(s) for the analysis. This discussion included:

- A. The ESA and Save Energy Now program
- B. Program and Plant expectations
- C. A preliminary discussion of required steps.

1. Target Equipment Identification

- Identify which process heating device(s) will be used for the assessment. Suggested criteria includes:
 - A. The equipment type should represent a significant use of energy.
 - B. There should be a means to collect operating data from the equipment that will be entered into the PHAST program for analysis.
 - C. Participants should suspect the machine(s) represents significant energy savings opportunities.

The Group decided to examine the performance of the holding furnaces on the die casting machines, Number 9 and Number 10 Melting Furnaces.

2. Review Heat Supply and Demand (Sankey Diagram)

3. Review the PHAST program – illustrating what data would need to be collected

4. Discuss data collection techniques and tools. Basic Tool list includes (As provided by ESA Specialist):

1. Temperature measuring devices

5. Collected Basic Information for entry into the PHAST program.

- a. Researched production data. Actual quantities of metal melted are difficult to determine in that much of the work load is in-process scrap. After interviewing plant operating personnel, participants arrived at assumptions of the quantity of the aluminum melted and checked it against actual natural gas meter readings for the furnaces in question. The results of this analysis was deemed by the participants to be of sufficient accuracy as to allow for the completion of the analysis on melting furnaces # 9 and #10.
- b. Collected data from individual furnace electric or natural gas meters.
- c. Estimated furnace surface areas and measured casing temperatures.
- d. Estimated furnace door open time by interviewing plant operating personnel and direct observation.

6. Created a spreadsheet to summarize information using weighted averages for furnace wall temperatures for entry into the PHAST program. Created spreadsheet to estimate the quantity of aluminum melted each day.

7. Entered the above data into the PHAST program. Checked veracity of the analysis by comparing expected results to actual meter readings.

8. Reviewed existing energy consumption and production data. Discussed accuracy of this data.

9. Discussed ongoing projects aimed at improving furnace energy efficiency per pound of aluminum melted. Determined which projects would be complementary to existing initiatives.

10. Perform “what if” analysis for various energy savings opportunities.

- a. Melting Furnace # 10 – open only one door during furnace loading and cleaning. By opening only one door, furnace gross energy consumption could be reduced approximately 38,997 mmBTU / year.
- b. Melting Furnace # 10 – reduce the time only one loading door is open with by reloading multiple hoppers. Assuming the recommendation in 10.a.(above) and this recommendation are followed, furnace gross energy consumption could be reduced approximately 2,233 mmBTU / year.
- c. Melting Furnace # 9 – capture waste heat in the furnace exhaust using a stack recuperator to preheat combustion air to 750 F. Using this approach, the furnace gross energy consumption could be reduced approximately 54,309 mmBTU / year.
- d. Die Cast holding furnaces – reduce the exposed open dip well by the addition of a refractory board. Using this approach on 41 holding furnaces, the furnace gross energy consumption could be reduced approximately 2,993 mmBTU / year or 876,941 kwh / year.

11. Discuss / Estimate expected capital / implementation costs for “what if” opportunities. Completed a spreadsheet illustrating the expected paybacks.

12. Presented our finding to plant energy Fast Start Group.

General Observations of Potential Opportunities:

Near Term opportunities: **Near Term Savings 41,230 mmBtu**

1. Melting Furnace # 10 – open only one door during furnace loading and cleaning.
2. Melting Furnace # 10 – reduce the time only one loading door is open with by reloading multiple hoppers. The above will require an investment in new hopper equipment that does not require a manual dump release.

For steps 1 – 2 above, the fuel savings will be approximately 41,230 mmBTU / year.

Note: Due to production volume decreases at the facility, #10 furnace has been idled. Prior to shutdown of furnace #10, the plant was working to develop an automatic material delivery mechanism (Box Tipper). This work has since stopped due to the idling of the furnace. If production volume changes warrant the return to service of this furnace, this energy savings opportunity will be reviewed again for implementation.

Near Term opportunity: **Near Term Savings 2,993 mmBtu (1314 mmBtu based on 18 furnaces-see note below)**

3. Die Cast Holding Furnaces – Install a refractory board cover to reduce losses from the open dip well.

For steps 3 above, the electricity savings will be approximately 2,993 mmBTU / year or 876,941 kwh / year.

Note: The proposed project involves creating a frame that contains a refractory board to reduce the energy losses from the open dip well of the die cast holding furnaces. This proposal reduces the overall open area by 25% (4ft² to 3 ft²). The total savings of this opportunity was based on 41 open dip wells. At the time of this writing, there are currently 32 open dip wells in production. Based on production volume decreases, it is anticipated to be reduced to 18. This will decrease the potential savings from 2,993 mmBTU/year to 1314 mmBTU /year or 385,000 kwh/year.

Medium Term opportunity: **Medium Term Savings 54,309 mmBtu**

4. Melting Furnace # 9 – Install a stack recuperator to preheat combustion air to 750 F.

For step 4 above, the fuel savings will be approximately 54,309 mmBTU / year

Note: An analysis of this energy saving opportunity has indicated that it will require additional equipment (controls) in addition to the stack recuperator. This opportunity will exceed the company's acceptable payback criteria. This item will be tracked and re-evaluated in the future.

Management and UAW Support and Comments:

A corporate level management team and the UAW/WFG Joint Task Team encourage any effort that reduces the Energy usage at all of its plants located around the country. General Motors has a target to reduce energy use and costs by 6% this year. They have an Energy Engineer with this assignment at each facility.

The UAW/WFG Joint Task Teams have identified several Department of Energy (DOE) best practices that will have a significant impact if implemented at GM Facilities. Due to the focus of the Best Practices there is an opportunity for our UAW Skilled Trades to provide a substantial cost savings impact to the operating costs of our facilities by working jointly with the GM/WFG management organization.

UAW/WFG Joint Task Team, DOE associated Best Practices:

BMES-01 Pumping System Assessment Tool

BMES-02 Air Master + Diagnostic Tool

BMES-03 Motor Master + Diagnostic Tool

BMES-04 Steam System Assessment Tool

BMES-07 Fan system Assessment Tool

BMES-09 Chilled Water System Assessment Tool

The UAW Skilled Trades working in conjunction with the GM/WFG Energy & Utilities Services Group (EUSG) and the GM/WFG Facilities Management Group (FM) can jointly pursue the effort to optimize the operating efficiencies of these major systems that are found in GM facilities.

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